

## CLAIMS

1. A three-dimensional conveyor having plural top plate units constituted respectively of a top plate having a top face for mounting a conveyed article and a clasping plate fixed to a bottom face of the top plate for fitting and holding couplers, the top plate units being connected together by the couplers to construct an endless conveyance path in three-dimensional directions, wherein two ball-holding cavities are formed in a front portion and a rear portion of each of the top plate units and coupler rod insertion holes are formed to pass through from the ball-holding cavities to a front face or rear face of the top plate unit so as to enable movement of the couplers in three-dimensional directions within a prescribed angle range; and the coupler is constituted of a coupler rod inserted in the coupler rod insertion hole and two terminal balls at the ends of the coupler rod, the respective balls being fit loosely into the ball-holding cavities turnably; whereby the respective top plate units coupled together by the couplers are rotatable in  $360^{\circ}$  around the center line in traveling direction of the top plate units and are turnable freely upward, downward, rightward, leftward, or slantingly around the center of the terminal ball as the supporting point.
2. The three-dimensional conveyor according to claim 1, wherein the distance between the centers of the two ball-

holding cavities formed in the front portion and the rear portion of the top plate unit and the distance between the centers of the two terminal balls at the ends of the coupler are both designed to be equal to half the arrangement pitch length of the adjacent top plate units to make uniform the distances between the adjacent joints.

3. The three-dimensional conveyor according to claim 1 or 2, wherein a sprocket engagement portion for engaging with a sprocket for conveyor driving is provided on each of the right and left sides of the ball-holding cavities on the top plate or clasp plate of the top plate unit to drive the conveyor by direct engagement of the top plate units with the sprocket.

4. The three-dimensional conveyor according to any of claims 1 to 3, wherein a U-shaped groove opening outward is provided on each of the right and left outsides of the sprocket engagement portion formed on the top plate or the top plate and clasp plate, and the top plate unit is guided, by engagement of a guide rail with the guide groove, in three-dimensional directions along a conveyance line formed by the guide rail.

5. The three-dimensional conveyor according to any of claims 1 to 4, wherein the forward path and returning path of the endless conveyor constituted of the top plate units connected by the couplers are arranged in two stairs, and

the top plate units are reversed in the returning path to bring the top plate faces upward for conveyance of an article in both the forward path on the upper stair and the returning path on the lower stair.

6. The three-dimensional conveyor according to any of claims 1 to 5, wherein a cushioning material is provided on the top plate face for cushioning the conveyed article.

7. The three-dimensional conveyor according to claim 6, wherein the cushioning material provided on the top plate face is a soft fuzzed member or a gill-shaped member.

8. The three-dimensional conveyor according to any of claims 1 to 7, wherein slip-stopping ledges are provided at intervals of a prescribed number of the top plate units for preventing slip of the conveyed articles on the top plate faces of the top plate units connected together.

9. The three-dimensional conveyor according to any of claims 1 to 8, wherein the coupler is constituted of a metal material, and the peripheral outside faces of the terminal balls are coated with a hard synthetic resin material having a low frictional coefficient, or are treated for film coating to lower the frictional coefficient.

10. The three-dimensional conveyor according to any of

claims 1 to 9 wherein a lubricant pool for filling a lubricant is provided in a portion of the ball-holding cavity formed in the top plate unit.

11. The three-dimensional conveyor according to any of claims 1 to 10 wherein a lubricant pool is provided in a portion of the terminal ball formed at the end of the coupler.

12. The three-dimensional conveyor according to any of claims 1 to 11 wherein an article-catching mechanism for catching a conveyed article is provided on the top face of the top plate.

13. The three-dimensional conveyor according to any of claims 1 to 12, wherein a projecting pin is provided to project downward at the center of bottom face of each of the top plate units, and a laterally rotating sprocket is allowed to engage with the projecting pins to drive the conveyor constructed in one level or plural stairs.

14. The three-dimensional conveyor according to claim 13, wherein a roller is pivotally supported rotatably on the outside periphery of the projecting pin projecting vertically downward, and the roller is allowed to engage with the laterally rotating sprocket.